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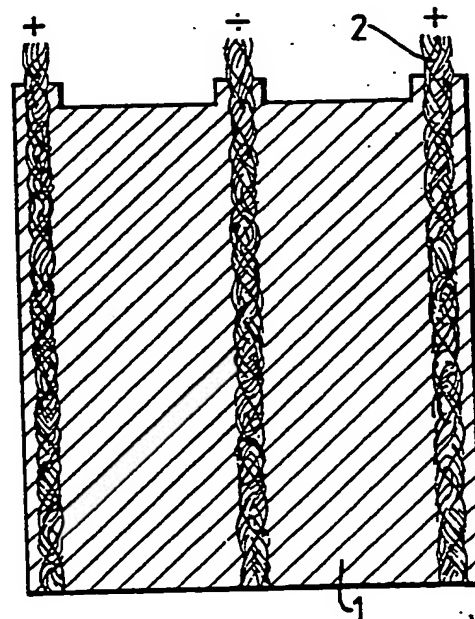
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| (51) International Patent Classification⁴ : H05B 3/14, B60N 1/00 H01M 10/50 | A1 | (11) International Publication Number: WO 87/ 01549 (43) International Publication Date: 12 March 1987 (12.03.87) |
| (21) International Application Number: PCT/NO86/00061 (22) International Filing Date: 26 August 1986 (26.08.86) (31) Priority Application Number: 853341 (32) Priority Date: 26 August 1985 (26.08.85) (33) Priority Country: NO (71)(72) Applicants and Inventors: IRGENS, Odd, Stephan [NO/NO]; N-3155 Åsgårdstrand (NO). SÆTEVIK, Geir [NO/NO]; Ormelet, N-3145 Tjøme (NO). (74) Agent: REISTAD, Gunnar, Ole; Bryns Patentkontor A/ S, Postboks 9566, Egertorget, N-0128 Oslo 1 (NO). (81) Designated States: AT (European patent), BE (Euro- pean patent), CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (Euro- pean patent), IT (European patent), JP, NL (Euro- pean patent), | | SE (European patent), SU, US. Published <i>With international search report.</i> <i>In English translation (filed in Norwegian).</i> |
| (54) Title: A DEVICE FOR HEATING WITH ENERGY SAVING IN CARS AND BOATS | | |
| (57) Abstract <p>A device for heating with energy saving in a car or boat comprises a current conductive plastic element (1) and embedded braided electrodes (2) with an electric connection (5). The device in the shape of a battery heater (3) is insulated on the surface. When connected with a battery (7) said element (1) will maintain a constant temperature in said battery (7) which will, thus, maintain its capacity when the surrounding temperature decreases. When the state of said battery is good the floor and seat heating elements (1) may be connected at connections (5) and (6). The self-adjusting effect of the material (1) causing power consumption to decrease with increasing temperature, and combined with a homogenous surface temperature makes this solution specially energy saving.</p> <p><i>Leie Løvsaker, som den latende Felle Løvsaker 9, Høyre 1 f. Felle 6-1</i></p> | | |



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A device for heating with energy saving in cars and boats

The present invention relates to a device for heating with energy saving in cars and boats, comprising an electrically conductive plastic element, electrodes, and an electric connection. The invention was developed to reduce problems with cold environments in cars and boats, e.g. starting problems and difficulties with keeping ones feet and buttocks warm. Electric batteries have low capacity at low temperatures, and this may sometimes cause starting problems. A car/boat battery only shows full capacity at temperatures above 25°C. In cooler weather its capacity is drastically reduced.

In order to remedy this, experiments were made with new kinds of batteries and more capacity, and it was found by experiments that thicker cell plates of the battery improve its capacity. The disadvantage is that the weight and the physical size of the battery increase as well. A heated driver's seat in the car compartment is generally used. This is based on a heater cable arranged in a loop in the back rest and in the seat. Said heater cable consists of a thin electric wire, a connection and a thermostat.

With the heated seat of the kind known to day there is a big risk of breaking the heat conductor and the connection, and there have been cases where heat conductors provided with a thermostat failed and resulted in a fire in the seat. Furthermore, when a heating cable is used, it is necessary to use a high temperature on the cable in order to achieve a uniform temperature in the seat. Power consumption will be equally high.

According to the invention a device is proposed, as stated above, which device is characterized in that a heating plate that is resistant to rupture and fire and shows an energy saving and self-adjusting effect keeps the battery heated and, thus, the battery capacity on an acceptable level when it is cold, and that said element may also be stitched into the seat upholstery and rug to act as a compartment/cabin/person heater.

Said device is intended to be firmly mounted in a car or a boat, and current is, thus, taken from the battery to a plastic plate element. Said plate element comprises three electrodes that are resistant to rupture and are embedded in a current
5 conductive plastic plate. When electric current is connected the entire plate surface gets uniformly warm. Said electrodes that are current-carrying are bridged metal conductors which results in a much stronger electric connection than for any other heating element. At the same time the fabric is suffic-
10 iently slack to move with the expansion coefficient of the plastic. Utilization of such a heating element in combination with a car/boat battery will increase the battery capacity considerably in cold weather and, thus, the period of time when there is electric power at one's disposal.

15 All cars and most boats are equipped with a battery with some space at the place where the battery is arranged. According to the invention said heating element is designed to be secured about the battery like a belt and it is provided with extended
20 electrodes running to the respective battery poles. Advantageously said element may be joined by other materials, and it may e.g. be stitched, nailed, screwed or riveted to textile, a rug, plastic, or the like. Said element may, e.g. be designed for being stitched into the seat upholstery, a heated chair
25 etc. Advantageously said element prevents static electricity by the aid of its conductivity. Preferably, the consistency of said device is arranged in such a manner that the resistance of said element increases linearly with increasing temperature, which will result in low power consumption at high environmental
30 temperatures and will make a thermostat redundant. This means that said element is self adjusting and energy saving in use as a heating element in a car/boat. Advantageously, said element removes condensation in boats and prevents moisture in a car floor.

35 The device according to the invention may advantageously comprise a total heating solution for a car/boat with battery/heating elements prolonging the period of available power in

combination with self-adjusting heat in the back rest, seat, and floor.

The invention is now to be disclosed in more detail with reference to the drawing wherein

Figure 1 is a sectional view of an element according to the invention,

Figure 2 shows the plate shaped element according to Figure 1 as seen in section from above,

Figure 3 is an isometric view of a tabbery provided with heating elements,

Figure 4 is an isometric view of the heating seat.

15 The device shown in Figures 1 - 4 comprises a conductive plastic element (1) and three electrodes (2). Said plastic plate can be shaped as desired, inter alia as a chair seat and back rest, see Figure 4. Electrodes (2) are special resilient bridged metal conductors resistant against mechanical stress, e.g. bending, stretching and pressure. In consequence they may be embedded in a plastic body. When power is connected with said electrodes (2) current is conducted through the plastic (1) from a positive to a negative electrode (2). When said plastic plate (1) is cold there is low resistance in the material and said plate (1) will be rapidly heated. With increasing temperature the resistance in the material will increase and, finally, there will hardly be any current passing through, but the temperature will be maintained at a constant level.

30 In Figure 3 the entire heating element for the battery is enveloped in a non-conductive and acid-proof plastic material (3). A gas tight chord anchorage in the shape of a clamping and locking member (4) for the insulated electric line (5) is embedded in said heating element (1). Said line (5) may be provided with a contact (6) that is inserted into the opening for the cigaret lighter. A total solution is also feasible, where all elements (1) may be connected with a console compris-

— ing OFF-ON-switches, timer, and state control.

In Figure 4 the heating seat is provided with slot shaped openings (8) in the seat member and back rest member to provide for good ventilation. Holes (9) improve the flexibility.

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CLAIMS:

1. A device for heating in an energy saving manner, e.g. in a car or a boat, comprising a current conductive plastic heating element provided with embedded electrodes for electric
5 connection, characterized in that said heating element is provided with bridged, resilient and metallic electrodes intended for being embedded and for severe mechanical stress, as well as extremely good electric contact surfaces between the fibres in the bridged cable and plastic.
10
2. A device as defined in claim 1, characterized in that said plastic heating element may be stitched directly onto a seat upholstery or a rug in all parts of said element, inclusively through said
15 electrodes.
3. A device as defined in claim 2, characterized in that recessed holes in the heating seat improve the flexibility, and that a special
20 series of holes in the seat and back rest member causes optimal ventilation for the passenger sitting in said heating seat.
4. A device as defined in claim 3, characterized in that electrodes embedded in
25 plastic are completely separated, so that self-ignition cannot occur.
5. A device as defined in one of the preceding claims, characterized in that said device is energy
30 saving due to the fact that the power consumption will decrease linearly with increasing temperature and uniform heat is developed across the entire surface.
6. A device as defined in one of the preceding claims,
35 characterized in that a system of elements is designed to form a total heating solution, wherein increased battery capacity delivers more heating effect to the compartment/cabin.

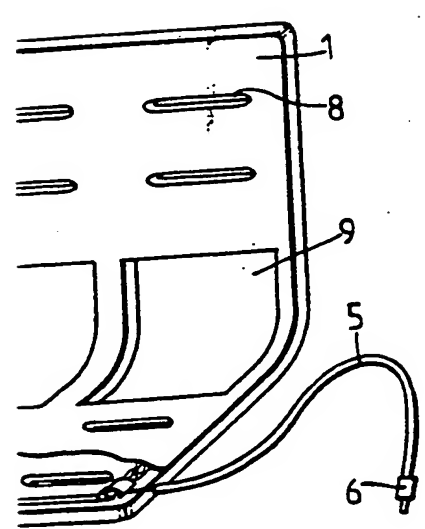
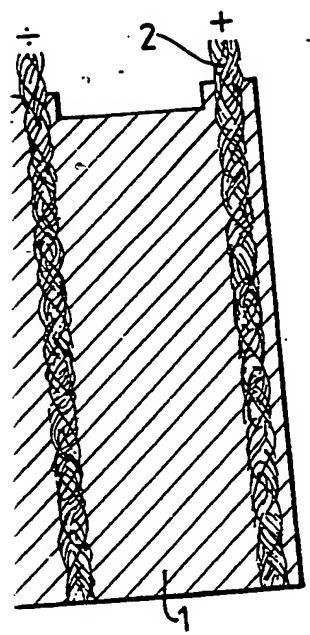
7. A device as defined in one of the preceding claims, characterized in that said elements prevent static electricity.

5 8. A device as defined in one of the preceding claims, characterized in that said heating element may be shaped as desired.

9. A device as defined in one of the preceding claims,
10 characterized in that heating by the aid of said plastic heating element causes improved charging susceptibility and, thus, correspondingly reduced fuel consumption.

15 10. A device as defined in one of the preceding claims, characterized in that three electrodes are used for achieving very rapid and uniform heating all over the element surface, and that three electrodes in stead of four considerably simplify the electric connection, and that
20 an electric change-over switch can disconnect the center electrode in order to reduce to 1/4 effect.

11. A device as defined in one of the preceding claims, characterized in that the connector between
25 said embedded electrodes and the electric supply cable consists of a gas-tight clamp member placed in said element.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/NO86/00061

| I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁹ According to International Patent Classification (IPC) or to both National Classification and IPC ⁴ H 05 B 3/14, B 60 N 1/00, H 01 M 10/50 | | | | | | | | |
|--|---|-------------------------------------|-----------------------|------------------------|------------------|--|--------|---------------|
| II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">IPC ⁴</td> <td style="padding: 5px;">B 60 N 1/00; H 01 M 10/50; H 05 B 3/10-/20, 3/34-/38; H 01 M 45/02</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">Nat Cl</td> <td style="padding: 5px;">21h:2/01, /03</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸</div> | | | Classification System | Classification Symbols | IPC ⁴ | B 60 N 1/00; H 01 M 10/50; H 05 B 3/10-/20, 3/34-/38; H 01 M 45/02 | Nat Cl | 21h:2/01, /03 |
| Classification System | Classification Symbols | | | | | | | |
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| Nat Cl | 21h:2/01, /03 | | | | | | | |
| SE, NO, DK, FI classes as above | | | | | | | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ | | | | | | | | |
| Category ⁹ | Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹³ | | | | | | |
| Y | SE, B, 405 873 (RHONE-POULENC-TEXTILE) 8 January 1979 See page 1, lines 1-6 & NL, 7305141 LU, 67478 FR, 2181482 DE, 2320714 BE, 798640 GB, 1372656 CH, 5664/73 CH, 560278 US, 3940533 AT, 333235 CA, 1020414 | 7 | | | | | | |
| Y | SE, B, 434 204 (BULTEN-KANTHAL AB) 9 July 1984 See page 2, lines 30-35 & FR, 2410412 GB, 2010650 DE, 2850664 JP, 54081539 SE, 7713250 <div style="text-align: right; margin-top: 10px;">.../...</div> | 3 | | | | | | |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"G" document member of the same patent family</p> </div> </div> | | | | | | | | |
| IV. CERTIFICATION | | | | | | | | |
| Date of the Actual Completion of the International Search 1986-10-01 | Date of Mailing of this International Search Report 1986 -10- 0 8 | | | | | | | |
| International Searching Authority Swedish Patent Office | Signature of Authorized Officer <div style="text-align: center;"> Roland Landström </div> | | | | | | | |

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II Fields searched (cont).

US Cl 136:161;
219:202, 209, 212, 217, 528-529,
536, 541, 543, 549;
429:61-62, 120

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
☐ No protest accompanied the payment of additional search fees.

| III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET) | | |
|--|---|------------------------------|
| Category * | Citation of Document, with indication, where appropriate, of the relevant passages | Relevant to Claim No |
| Y | DE, C, 118 666 (HEIM) 18 February 1900 See page 1, column 2, line 30- page 2, column 2, line 6. | 6, 9 |
| Y | DE, A, 2 006 165 (RENFREW ELECTRONICS LTD). 6 May 1971 See page 2, line 18- page 3, line 11, page 6, lines 7-13. & FR, 2041047 | 2, 11 |
| Y | DE, C1, 3 340 882 (MESSERSCHMITT-BÖLKOW- BLOHM GMBH) 27 June 1985 See abstract | 6, 9 |
| Y | CH, A, 280 399 (ALLMÄNNA SVENSKA ELEKTRI- SKA AKTIEBOLAGET) 16 May 1952 See especially page 2, lines 50- 57. | 10 |
| X Y | CH, A5, 445 668 (DOW CORNING CORPORA- TION) 29 February 1968 See column 1, lines 6-19, column 3, lines 10-48 and figures 1-3. | 1, 4, 8 2-3, 5-7, 9-11 |
| Y | FR, A1, 2 287 143 (TOCKSFORS VERKSTADS AB) 30 April 1976 See especially page 3, lines 29-36- & NL, 7511493 DE, 2543907 AU, 85245/75 JP, 51082436 SE, 7412341 | 3 |
| Y | US, A, 3 527 925 (TADAO TOYOOKA ET AL) 8 September 1970 See especially figures 10-11 & GB, 1230591 DE, 1771073 FR, 1557516 | 6, 9 |
| | .../... | |

| III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET) | | |
|--|--|--------------------------------|
| Category* | Citation of Document, with indication, where appropriate, of the relevant passages | Relevant to Claim No |
| Y | US, A, 3 593 002 (HERBERT) 13 July 1971 See column 1, line 73- column 2, line 26 | 11 |
| Y | US, A, 3 594 547 (QUINN) 20 July 1971 See especially abstract and column 1, lines 32-57 & NL, 6818342 DE, 1816051 CH, 489174 FR, 1597041 GB, 1253210 BE, 725906 | 6, 9 |
| Y | US, A, 3 621 192 (PHOLER) 16 November 1971 See abstract and column 1, line 35-49 and column 2, line 37-40 & CH, 500689 AT, 306871 | 5 |
| X Y | US, A, 4 242 573 (BATLIWALLA) 30 December 1980 See column 2, line 62- column 3, line 26. & NL, 7908690 FR, 2443125 GB, 2038549 DE, 2948349 AU, 54931/80 CA, 1146206 SE, 7909911 AU, 539386 SE, 436528 .../... | 1, 4-5, 8 2-3, 6-7, 9-11 |

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

| Category * | Citation of Document, with indication, where appropriate, of the relevant passages | Relevant to Claim No |
|------------|---|-----------------------------|
| X Y | US, A, 4 277 673 (KELLY) 7 July 1981 See column 8, line 48-57 and claim 1 & FR, 2452768 DE, 3011754 GB, 2047957 AU, 56850/80 JP, 55154003 JP, 56165203 US, 4327480 CA, 1136846 US, 4367168 AU, 534374 DE, 3050761 | 1,4-5,8 2-3,6-7, 9-11 |